

PUBLICLY OWNED TREATMENT WORKS (POTWS)

SCC: 2630020000

Publicly owned treatment works (POTW) facilities are owned by a municipality, state, an intermunicipality or interstate agency, and departments/agencies of the federal government. The definition of a POTW facility includes intercepting sewers, outfall sewers, sewage collection systems, pumping, power, and other equipment. The

wastewater treated by these POTWs is generated by industrial, commercial, and domestic sources. The national emission estimates for POTW facilities were calculated using an interpolated nationwide flow rate for baseyear 2002, and then applying emission factors for VOCs, ammonia, and 53 HAPs. Nationwide projected flow rates for

2000 and 2005 were available from an EPA report², and are summarized in Table 1. In 2000, flow rate was estimated to be 34,710 million gallons per day (MMGD); in 2005, flow rate was estimated to be 37,085 MMGD. The interpolated 2002 nationwide flow rate (using a linear regression) was calculated at 35,660 MMGD, or 13,015,900 million gallons annually.

The ammonia emission factor was obtained from a report to EPA³, while the VOC emission factor was retrieved from FIRE program.⁴ Emission factors for the 53 HAPs were derived using 1996 area source emissions estimates

that were provided by ESD and the 1996 nationwide flow rate. Table 2 lists the 53 HAPs, the 1996 area source emissions, and the derived emission factor in pounds per million gallons treated. It was assumed that the emission factors derived from the 1996 information are applicable for the year 2002. Emissions were allocated to the county

level by the county proportion of the U.S. population. Appendix B contains the total population data in database format.

It is important to note that the emission estimates for this category represent total emissions. When the 2002 point source NEI is released, it will be necessary to determine whether there are point source emissions in SCCs 50100701 through 50100781 and 50100791 through 50182599 that will need to be subtracted to yield the nonpoint source emission estimates for this category.

The national POTW flow rate estimate does not include Puerto Rico or the U.S. Virgin Islands. Emissions for Puerto Rico and the U.S. Virgin Islands were estimated using the approach outlined in the report text. Broward County in Florida is assumed to be the surrogate county for Puerto Rico. Monroe County in Florida is assumed to be the surrogate for the U.S. Virgin Islands. POTW emissions in the surrogate counties were divided by the population

of the surrogate counties obtained from the U.S. Census Bureau to estimate emissions on a per capita basis. The per capita emissions were then multiplied by the population in each county of Puerto Rico and the U.S. Virgin Islands to estimate emissions. The emissions data reported in Table 2 include the emission estimates for Puerto Rico and the U.S. Virgin Islands.

Example Calculations:

The 1996 flow rate per day was 32,175 MMGD. (1996 was a leap year.) Annually, this computes to: 32,175

$$\text{MMGD treated} * 366 \text{ days} = 11,776,050 \text{ million gallons treated}$$

Benzene emissions in 1996 for area source POTWs were estimated to be 461.44 tons per year. The derived benzene emission factor is calculated as follows:

$$\text{Benzene emission factor} = (461.44 \text{ tons} * 2000 \text{ lb/ton}) / (11,776,050 \text{ million gallons treated})$$

$$\text{Benzene emission factor} = 0.078369 \text{ lb/million gallons treated}$$

Benzene estimates for 2002 for area source POTWs (excluding Puerto Rico and U.S. Virgin Islands) are calculated as follows:

$$2002 \text{ Benzene emissions} = (35,660 \text{ MMGD} * 365 \text{ days}) * (0.078369 \text{ lb/million gallons treated})$$

$$\text{Benzene emissions} = 1,020,043 \text{ pounds} = 510.02 \text{ tons/year}$$

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Data Parameters

Table 1 - National Flow Rates, 1996-2005

Year	Flow rate (MMGD)	Reference
1996	32,175	6
2000	34,710	2
2002	35,660	interpolated by linear regression
2005	37,085	2

Table 2 - Emission Factors and National-Level Estimates

Pollutant	1996 Emissions (tpy)	Derived Emission Factor (lb/MMGAL)	2002 Emissions (tpy)
1,1,2,2-Tetrachloroethane	0.12	2.0380E-05	0.1335
1,1,2-Trichloroethane	0.08	1.3587E-05	0.0890
1,2,4-Trichlorobenzene	5.92	1.0054E-03	6.5839
1,3-Butadiene	1.72	2.9212E-04	1.9129
1,4-Dichlorobenzene	14.76	2.5068E-03	16.4152
1-Chloro-2,3-Epoxypropane	0.31	5.2649E-05	0.3448
2,4-Dinitrotoluene	3.3	5.6046E-04	3.6701
2-Nitropropane	0.02	3.3967E-06	0.0222
Acetaldehyde	21.27	3.6124E-03	23.6552
Acetonitrile	23.67	4.0200E-03	26.3244
Acrolein	26.3	4.4667E-03	29.2493
Acrylonitrile	26.47	4.4956E-03	29.4384
Allyl Chloride	1.33	2.2588E-04	1.4791
Ammonia	NA	1.90E+01	124,417.9275
Benzene	461.44	7.8369E-02	513.1862
Benzyl Chloride	0.56	9.5108E-05	0.6228
Biphenyl	5.16	8.7636E-04	5.7386
Carbon Disulfide	296.41	5.0341E-02	329.6496
Carbon Tetrachloride	77.35	1.3137E-02	86.0241
Chlorobenzene	33.13	5.6267E-03	36.8452
Chloroform	441.89	7.5049E-02	491.4438
Chloroprene	1.63	2.7683E-04	1.8128
Cresols (includes o,m,p)	0.11	1.8682E-05	0.1223
Dimethyl Sulfate	0.09	1.5285E-05	0.1001
Ethyl Acrylate	0.12	2.0380E-05	0.1335
Ethyl benzene	525.48	8.9246E-02	584.4077
Ethylene Oxide	15.22	2.5849E-03	16.9268
Formaldehyde	1.35	2.2928E-04	1.5014

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Table 2 (continued)

Pollutant	1996 Emissions (tpy)	Derived Emission Factor (lb/MMGAL)	2002 Emissions (tpy) ¹
Glycol Ethers	788.86	1.3398E-01	877.3233
Hexachlorobutadiene	0.05	8.4918E-06	0.0556
Hexachlorocyclopentadiene	0.04	6.7935E-06	0.0445
Methanol	782.48	1.3289E-01	870.2278
Methyl Chloroform (1,1,1-Trichloroethane)	38.62	6.5591E-03	42.9509
Methyl Ethyl Ketone (2-Butanone)	195.16	3.3145E-02	217.0454
Methyl Isobutyl Ketone (Hexone)	184.45	3.1326E-02	205.1343
Methyl Methacrylate	21.31	3.6192E-03	23.6997
Methyl tert-Butyl Ether	4.37	7.4218E-04	4.8601
Methylene Chloride	625.92	1.0630E-01	696.1111
N,N-Dimethylaniline	22.10	3.7534E-03	24.5783
Naphthalene	90.00	1.5285E-02	100.0927
Nitrobenzene	0.45	7.6426E-05	0.5005
o-Toluidine	0.12	2.0380E-05	0.1335
P-Dioxane	1.23	2.0890E-04	1.3679
Propionaldehyde	0.24	4.0761E-05	0.2669
Propylene Dichloride	0.79	1.3417E-04	0.8786
Propylene Oxide	50.21	8.5275E-03	55.8406
Styrene	187.35	3.1819E-02	208.3596
Tetrachloroethylene	292.47	4.9672E-02	325.2678
Toluene	839.51	1.4258E-01	933.6532
Trichloroethylene	20.98	3.5632E-03	23.3327
Vinyl Acetate	5.25	8.9164E-04	5.8387
Vinyl Chloride	0.46	7.8125E-05	0.5116
Vinylidene Chloride	29.01	4.9269E-03	32.2632
VOC	NA	9.90E+00 ²	64,828.2886
Xylenes (includes o, m, and p)	4100.05	6.9634E-01	4,559.8322

¹ Includes estimates for Puerto Rico and the U.S. Virgin Islands. ²
 Actual emission factor, not derived.

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References

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4. U.S. Environmental Protection Agency. Factor Information Retrieval (FIRE) program. Version 6.23.
5. Memorandum from Bob Lucas, EPA to Greg Nizich, U.S. Environmental Protection Agency. "Review of Baseline Emissions Inventory." October 16, 1998.
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